

WHAT IS CLAIMED IS:**1. A calibration system comprising:**

a calibration light source which outputs emission lines having a known emission-line wavelength;

a spectral luminometer which is to be calibrated, and provided with a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components, and adapted to measure an emission-line output of the calibration light source;

a wavelength estimator which estimates a wavelength of the emission-line output from relative outputs of the light receiver at a plurality of measurement wavelengths neighboring the emission-line wavelength when the spectral luminometer measures the emission-line output of the calibration light source; and

a wavelength calibrator which calibrates the wavelength of the spectral luminometer by estimating a wavelength change amount from a difference between the estimated wavelength of the emission-line output and the known emission-line wavelength.

2. A calibration system according to claim 1, wherein:

the spectral luminometer further includes a memory which stores in advance a correspondence table of output ratios of the light receiver at the plurality of measurement wavelengths neighboring the emission-line wavelength and the wavelength of the

emission-line output; and

the wavelength estimator estimates the wavelength of the emission-line output from the output ratios measured by the spectral luminometer and the correspondence table.

3. A calibration system according to claim 1, wherein the calibration light source includes:

a semiconductor laser which emits a laser beam;

a plurality of monitor sensors having different spectral sensitivities near an output wavelength of the semiconductor laser; and

an output wavelength estimator which estimates the output wavelength of the semiconductor laser from output ratios of the plurality of monitor sensors.

4. A calibration system according to claim 3, wherein:

the calibration light source further includes a memory which stores in advance a correspondence table of the output ratios of the plurality of monitor sensors and the output wavelength of the semiconductor laser; and

the output wavelength estimator estimates the output wavelength of the semiconductor laser from the output ratios of the plurality of monitor sensors and the correspondence table.

5. A calibration system according to claim 4, wherein:

the calibration light source further includes a temperature

sensor which detects temperatures of the plurality of monitor sensors;

the memory stores a plurality of correspondence tables corresponding to a plurality of temperatures of the plurality of monitor sensors; and

the output wavelength estimator estimates the output wavelength of the semiconductor laser based on the output ratios of the plurality of the monitor sensors and the temperature detected by the temperature sensor.

6. A calibration system according to claim 1, wherein the calibration light source further includes:

an incandescent light source;

a plurality of monitor sensors having different spectral sensitivities; and

a spectral intensity distribution estimator which estimates a spectral intensity distribution of the incandescent light source from outputs of the plurality of the monitor sensors.

7. A calibration system according to claim 6, further comprising:

a light receiver output estimator which estimates an output of the light receiver from the spectral intensity distribution estimated by the spectral intensity distribution estimator and the spectral sensitivities of the respective photoelectric conversion elements of the light receiver when the spectral luminometer

measures the emission-line output of the calibration light source;

a calculator which calculates a ratio of the estimated output of the light receiver to an actual output of the light receiver for each photoelectric conversion element; and

a sensitivity calibrator which calibrates the sensitivity of the spectral luminometer based on the calculated ratio for each photoelectric conversion element.

8. A calibration system according to claim 6, wherein:

the calibration light source further includes a memory which stores in advance a correspondence table of the output ratios of the plurality of monitor sensors and a relative spectral intensity distribution of the incandescent light source; and

the spectral intensity distribution estimator estimates the relative spectral intensity distribution of the incandescent light source from the output ratios of the plurality of monitor sensors and the correspondence table.

9. A calibration system according to claim 8, wherein:

the calibration light source further includes a temperature sensor which detects temperatures of the plurality of monitor sensors;

the memory stores a plurality of correspondence tables corresponding to a plurality of temperatures of the plurality of monitor sensors; and

the spectral intensity distribution estimator estimates the

relative spectral intensity distribution of the incandescent light source based on the output ratios of the plurality of the monitor sensors and the temperature detected by the temperature sensor.

10. A calibration system according to claim 1, further comprising:

a calculator which calculates a ratio of an emission-line intensity obtained from the outputs of the light receiver at a plurality of measurement wavelengths neighboring the emission-line wavelength to an output of the light receiver at a wavelength having no sensitivity at the emission-line wavelength;

a comparator which compares the calculated ratio with an initial value of the ratio stored beforehand; and

a stray-light level estimator which estimates a change in a stray-light level of the spectral luminometer based on result of the comparator.

11. A calibration system according to claim 1, further comprising:

a calculator which calculates a half-width of the light receiver near the emission-line wavelength based on the outputs of the light receiver at a plurality of measurement wavelengths neighboring the emission-line wavelength;

a comparator which compares the calculated half-width with an initial value of the half-width stored beforehand; and

a half-width estimator which estimates a change in a half-

width of the spectral luminometer based on result of the comparator.

12. A calibration system according to claim 1, wherein the spectral luminometer further includes:

a tristimulus value calculator which calculates tristimulus values based on the outputs of the light receiver at the respective measurement wavelengths and weight coefficients for the respective wavelengths, the tristimulus value calculator correcting the weight coefficients according to the wavelength change amount and calculating the tristimulus values using the corrected weight coefficients.

13. A calibration system according to claim 12, wherein:
the spectral luminometer further includes a memory which stores weight coefficients for wavelength errors; and

the tristimulus value calculator calculates the tristimulus values by selecting a weight coefficient corresponding to the wavelength change amount from the weight coefficients stored in the memory.

14. A calibration system according to claim 1, wherein the calibration light source includes:

a three-wavelength type fluorescent lamp; and
a band pass filter having a center wavelength near the emission-line wavelength of the fluorescent lamp.

15. A calibration system according to claim 14, wherein the

band pass filter is operable to adjust the incident angle of a beam propagating from the fluorescent lamp.

16. A calibration system according to claim 14, wherein the calibration light source is incorporated in the spectral luminometer.

17. A calibration system according to claim 1, wherein the calibration light source includes a low-pressure mercury lamp.

18. A calibration system according to claim 1, wherein the calibration light source includes a spectrocolumeter.

19. A calibration system for calibrating a spectral luminometer including a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components, comprising:

a calibration light source which outputs emission lines having a known emission-line wavelength;

a wavelength estimator which estimates a wavelength of the emission-line output from relative outputs of the light receiver at a plurality of measurement wavelengths neighboring the emission-line wavelength when the spectral luminometer measures the emission-line output of the calibration light source; and

a wavelength calibrator which calibrates the wavelength of the

spectral luminometer by estimating a wavelength change amount from a difference between the estimated wavelength of the emission-line output and the known emission-line wavelength.

20. A calibration system comprising:

a calibration light source including an incandescent light source;

a plurality of monitor sensors having different spectral sensitivities;

a spectral intensity distribution estimator which estimates a spectral intensity distribution of the incandescent light source from outputs of the plurality of monitor sensors;

a spectral luminometer which is to be calibrated, and provided with a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components, and adapted to measure an output light of the incandescent light source;

a light receiver output estimator which estimates an output of the light receiver from the spectral intensity distribution estimated by the spectral intensity distribution estimator and the spectral sensitivities of the respective photoelectric conversion elements of the light receiver when the spectral luminometer measures the output light of the incandescent light source;

a calculator which calculates a ratio of the estimated output

of the light receiver to an actual output of the light receiver for each photoelectric conversion element; and

a sensitivity calibrator which calibrates the sensitivity of the spectral luminometer based on the calculated ratio for each photoelectric conversion element.

21. A calibration system for calibrating a spectral luminometer including a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components, comprising:

a calibration light source including an incandescent light source;

a plurality of monitor sensors having different spectral sensitivities;

a spectral intensity distribution estimator which estimates a spectral intensity distribution of the incandescent light source from outputs of the plurality of monitor sensors;

a light receiver output estimator which estimates an output of the light receiver from the spectral intensity distribution estimated by the spectral intensity distribution estimator and the spectral sensitivities of the respective photoelectric conversion elements of the light receiver when the spectral luminometer measures the output light of the incandescent light source;

a calculator which calculates a ratio of the estimated output

of the light receiver to an actual output of the light receiver for each photoelectric conversion element; and

a sensitivity calibrator which calibrates the sensitivity of the spectral luminometer based on the calculated ratio for each photoelectric conversion element.

22. A method for calibrating a spectral luminometer, comprising the steps of:

outputting emission lines having a known emission-line wavelength from a calibration light source;

measuring an emission-line output of the calibration light source by a spectral luminometer which is to be calibrated, and provided with a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components;

estimating a wavelength of the emission-line output from relative outputs of the light receiver at a plurality of measurement wavelengths neighboring the emission-line wavelength; and

calibrating the wavelength of the spectral luminometer by estimating a wavelength change amount from a difference between the estimated wavelength of the emission-line output and the known emission-line wavelength.

23. A method for calibrating a spectral luminometer,

comprising the steps of:

estimating a spectral intensity distribution of an incandescent light source from outputs of a plurality of monitor sensors;

measuring an output light of the incandescent light source by a spectral luminometer which is to be calibrated, and provided with a light receiver having an array of photoelectric conversion elements for receiving lights produced by dispersing an incident light in accordance with wavelengths and outputting electrical signals corresponding to light intensities of the respective received wavelength components;

estimating an output of the light receiver from the estimated spectral intensity distribution and the spectral sensitivities of the respective photoelectric conversion elements of the light receiver;

calculating a ratio of the estimated output of the light receiver to an actual output of the light receiver for each photoelectric conversion element; and

calibrating the sensitivity of the spectral luminometer based on the calculated ratio for each photoelectric conversion element.